Newark Bay Study Area

Reconnaissance Survey Work Plan

Baseline Human Health and
Ecological Risk Assessment

Tierra Solutions, Inc.

East Brunswick, New Jersey

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Appendices

1. Introduction

This Reconnaissance Survey Work Plan describes the activities that will be conducted during the Reconnaissance Survey as part of the Baseline Human Health and Ecological Risk Assessment (BHHERA) for the Remedial Investigation/Feasibility Study for the Newark Bay Study Area (NBSA). The NBSA is defined as Newark Bay (the Bay) and portions of the Hackensack River, Kill van Kull, and Arthur Kill (U.S. Environmental Protection Agency [USEPA] 2004). A regional map showing the NBSA is provided as Figure 1-1.

The majority of the Reconnaissance Survey will be conducted along the shoreline of the Bay, which is approximately 5 miles long and 1 mile wide. The Bay's shoreline consists of a variety of land uses, including commercial, industrial, and residential. Habitat types include mud, sand, cobble flats and small wetland/intertidal areas.

Results of the Reconnaissance Survey will serve multiple purposes, including identifying and documenting human and ecological uses of the shoreline, identifying sampling locations for subsequent field efforts (fall 2013 through 2014)[1], optimizing sampling methodology, and identifying wildlife species inhabiting the study area, all of which will further support the BHHERA.

1.1 Objectives

The methods used to conduct the Reconnaissance Survey will be consistent with relevant guidance provided by USEPA, and is a standard procedure prior to conducting a large scale sampling program. For the ecological evaluation, the standard procedure for the initial scoping and reconnaissance process is described in *Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments, Interim Final* (USEPA 1997), specifically Step 5: Field Verification of Sampling Design. For the human health evaluation, this includes USEPA's Memorandum entitled *Considering Reasonably Anticipated Future Land Use*

[1] Subsequent field efforts that include tissue and sediment sample collection are anticipated to commence during the fall of 2013. Sampling for the BHHERA is expected to take approximately one year to complete, culminating at the end of the calendar year, 2014.

and Reducing Barriers to Reuse at EPA-lead Superfund Remedial Sites from James E. Woolford to Superfund National Program Managers (USEPA 2010).

The Problem Formulation (Tierra Solutions, Inc. [Tierra] 2013a) for the NBSA identifies the risk questions that will be answered in the BHHERA. Data that are needed to answer these questions are also identified in the Problem Formulation and include the collection and chemical analysis of surface water, biological tissue, and sediment samples. Prior to implementing such a large sampling program, the Reconnaissance Survey is necessary to evaluate and optimize these efforts. This preliminary work will assist the field crews in the subsequent fall sample collection by preemptively identifying safety concerns and facilitating planning for samples to be collected as efficiently and effectively as possible. As such, the Reconnaissance Survey will optimize the sampling design by locating appropriate sampling locations (especially in the intertidal areas), verifying access areas, and evaluating the efficacy of sampling approaches.

The intertidal areas were previously mapped during the Phase I and Phase II sediment investigations (Tierra 2013b). The current locations of the intertidal areas targeted for sampling are depicted on Figure 1-2. Ground-truthing current conditions of these intertidal areas is important because several hurricanes and storms have occurred since the areas were previously mapped. Such storms, together with ongoing development along the shoreline, may have potentially altered the intertidal areas by reducing their size or perhaps eliminating them completely. Some of these areas are also anticipated to be utilized by humans for recreational purposes (e.g., fishing, crabbing), but actual access to the shoreline needs to be confirmed. Also, it is important that the sampling equipment proposed for the investigation will be suitable to collect the biota samples in the intertidal and subtidal areas (e.g., crab and/or fish traps, clamming fork). The Reconnaissance Survey will verify that the target organisms will be available for tissue sampling. This will include identifying possible nest areas for the spring collection of bird eggs and exploratory sampling for benthic clams (e.g., *Mya arenaria* and *Macoma sp.*). In addition, a mammal survey will be conducted along the shoreline to identify potential mammal species that may utilize the NBSA.

The specific tasks and objectives that will be completed as part of the Reconnaissance Survey are as follows:

- Task 1 – Shoreline Habitat Characterization: The purpose of this task is to characterize the shoreline habitat of the NBSA (e.g., salt marsh, rip-rap, bulkhead).

- Task 2 – Shoreline Human Use Characterization: The purpose of this task is to categorize human use areas (e.g., industrial, residential, commercial) along the NBSA shoreline and to identify types of human activities (e.g., port/dock work, fishing, crabbing, swimming).

- Task 3 – Identification of Sampling Locations and Evaluation of Sampling Approaches: The purpose of this task is to identify preliminary sampling locations in the intertidal areas for subsequent sampling activities (Figure 1-2) and verify that the sampling equipment proposed for the investigation is suitable to collect the desired biota samples.

- Task 4 – Bird Nest Survey: The purpose of this task is to identify possible bird nesting areas for the collection of eggs during the 2014 nesting season.

- Task 5 – Mammal Survey: The purpose of this task is to document signs of mammal species that may utilize habitats within the NBSA.

1.2 General Methodology

The field effort for the Reconnaissance Survey will include crew(s) that will conduct multiple tasks simultaneously to evaluate current conditions within the NBSA and identify possible sampling areas for future data collection. For example, the shoreline habitat survey and human use survey will be conducted simultaneously, as the crew covers a specified area of the shoreline.

Because much of the NBSA consists of shallow subtidal flats, a small-sized boat will be needed to get close to the shore to properly observe the shoreline and associated intertidal areas. These areas will be surveyed for ground-truthing current conditions and evaluating the feasibility of future sampling activities. Members of the field crew will also walk the shoreline and record any observations regarding possible mammal presence and the locations of bird nesting areas.

Using a hand-held global positioning system (GPS), potential sampling locations in the intertidal areas will be identified and surveyed for sediment and benthic invertebrate tissue collection. Sediments of the intertidal areas will be explored to qualitatively evaluate the overall abundance of benthic invertebrates in terms of their ability to provide suitable tissue mass for future sampling activities. A variety of sampling tools/equipment will be brought and tested to optimize the sampling design.

The proposed activities for the Reconnaissance Survey will be conducted in accordance with the health and safety procedures and protocols outlined in the Newark Bay Study Area Remedial Investigation Work Plan (RIWP), Sediment Sampling and Source Identification Program, Volume 3 of 3, Health and Safety/Contingency Plan (HASP), Revision 1 (Tierra 2005). This HASP describes the health and safety requirements and potential hazards that may occur while working on a boat in the study area, including mobilization, sediment sampling, equipment decontamination, and demobilization. It also includes health and safety requirements for a reconnaissance survey. In the field, this HASP will be supplemented with task-specific hazard assessment information as necessary. In addition, the crew will decontaminate any sampling gear as needed between sampling locations and prior to leaving the study area. The procedures for equipment decontamination are described in both the HASP and field SOP-1 Decontamination in the Newark Bay Study Area Phase II RIWP, Volume 1a of 2, Addendum 1, Appendix F (Tierra 2007).

2. Shoreline Habitat Characterization

The purpose of this task is to characterize the shoreline habitat of the NBSA. The shoreline habitat characterization survey will include a detailed visual characterization of the NBSA and its related wetland areas. The shoreline habitat characterization will not include a detailed quantitative assessment of flora or fauna, but instead will document general cover types along the shoreline (e.g., salt marsh, rip-rap, bulkhead) and near-shore areas.

The objectives of the shoreline habitat characterization are as follows:

- Document the ecological community that exists within the NBSA
- Identify possible stressors (e.g., habitat limitations) that may be affecting the system
- Document the locations of environmentally sensitive habitats/natural resources that may occur in the NBSA
- Document potential contaminant migration/exposure pathways.

2.1 Methods

As part of this assessment, existing habitats and land use within the NBSA will be identified. This will include all NBSA shorelines that are visible by boat. Prior to conducting the field work, base maps and background data/information will be used to evaluate the layout and topography of the NBSA; note the reported locations of tributaries, waterways, and wetlands; and gather existing information on ecological use of the NBSA. The field crew(s) will then verify the pre-survey maps and information against actual NBSA conditions. The survey will be conducted systematically by boat. This survey will include visual observations during a slow-speed boat reconnaissance of the entire NBSA.

Both videographic and photographic records will be made of the entire shoreline. In addition, the location and extent of shoreline habitats will be determined using a hand-held GPS. It is anticipated that most, if not all, of the shoreline habitat characterization survey will be conducted by boat. If possible, some shoreline points may be accessed on foot to better identify and characterize specific areas that may be difficult to observe

by boat. However, at no time during the survey will the field crew(s) knowingly trespass on private property.

Ecologists conducting the survey will document the following:

- Land use along the NBSA shoreline (e.g., industrial, commercial, residential, or natural habitat)
- Shoreline characteristics, including, but not limited to, quantification of linear bulkhead, riprap, wetland vegetation, and aquatic habitat
- Observations of fish and wildlife
- Locations of plant communities that comprise the shoreline habitats (e.g., general species abundance, condition)
- The presence of larger outfalls, discharge pipes, and combined sewer overflows, including their location, condition, and visual observations on the state of discharge at the time of the survey.

The detailed procedures for conducting the shoreline habitat characterization survey are provided in Appendix A Standard Operating Procedure (SOP) – Shoreline Habitat Characterization.

2.2 Reporting

Results obtained as part of the shoreline habitat characterization survey will be documented in the Shoreline Habitat Characterization Field Data Sheet (Attachment A-1 to Appendix A) and utilized in the upcoming BHHERA. In addition, the survey will guide some of the additional tasks outlined in the following sections.

3. Shoreline Human Use Characterization

The shoreline human use characterization survey will be conducted simultaneously with the shoreline habitat characterization survey. The objectives of the shoreline human use survey are as follows:

- Characterize human use along the NBSA shoreline
- Identify areas with the greatest likelihood of possible usage.

As part of the survey, the entire shoreline will be characterized for possible human exposure/use areas, including fishing/crabbing spots, swimming beaches, access to the Bay, and residential areas. This effort will verify and supplement the existing desktop survey that was previously conducted as part of the Problem Formulation (Tierra 2013a).

3.1 Methods

Possible human use areas will be identified prior to the survey and plotted on maps. Potential human use/access areas will also be identified during the shoreline habitat characterization (conducted as part of Task 1 of the Reconnaissance Survey) and based on anecdotal evidence. These areas include fishing/crabbing locations, recreational access areas, and commercial/industrial working areas. Each location will be visited by members of the field crew by boat and photographed and documented. If possible, some areas may be accessed on foot to help better identify and characterize a specific activity that may be difficult to observe by boat. However, at no time during the survey will the field crew(s) knowingly trespass on private property. The detailed procedures for conducting the shoreline human use characterization survey are provided in Appendix B SOP – Shoreline Human Use Characterization.

Field personnel conducting the survey will document the following:

- Land use along the NBSA shoreline (i.e., industrial, commercial, residential, recreational, or natural habitat)
- Locations of possible heavily used access areas, such as shoreline parks, swimming beaches, or boat launches

- Observations of individuals using the shoreline for recreational purposes, including fishing, swimming, bathing, and/or sporting events

- Observations of individuals using the shoreline for commercial or industrial purposes, including port, dock, or marine workers.

3.2 Reporting

Human use areas will be surveyed as noted above. Observations of individuals using the area and the locations of access areas will be recorded on the Shoreline Human Use Characterization Field Data Sheet (Attachment B-1 to Appendix B) and photographed. Documentation will include the approximate location/area, GPS coordinates, date, time, and observed activity.

4. Identification of Sampling Locations and Evaluation of Sampling Approaches

The purpose of this task is to identify possible sampling locations in the intertidal areas and evaluate the efficacy of the proposed sampling equipment. The proposed sampling areas will be identified by the field crew prior to the survey using existing maps that document the locations of the intertidal areas (Figure 1-2). Because it is currently unknown if the intertidal areas are accessible at high tide, the field crew will document tidal conditions at the time of observation to evaluate the feasibility of sampling the areas during different tidal stages and verify that the conditions are appropriate for sampling.

Another purpose of this task is to verify that the sampling equipment proposed for the investigation will be suitable to collect the desired biota samples during future sampling events. Such preliminary sampling will determine if the target organisms (e.g., blue crabs and clams) are present and collectable in sufficient numbers or total biomass to meet the data needs identified in the Problem Formulation (Tierra 2013a). While the field crew is at a representative and accessible intertidal area, several sampling devices will be deployed to evaluate their efficacy for collecting benthic tissue samples, specifically blue crab and clams.

In summary, the objectives of this task are the following:

- Identify sampling locations in the intertidal areas
- Evaluate different sampling equipment.

4.1 Methods

The field crew will visit, by boat, each intertidal area identified on previously prepared maps. The accessibility for sampling each intertidal area will be evaluated at various tidal stages. If deemed accessible for sampling, the coordinates of the intertidal area and potential sampling locations will be recorded using a hand-held GPS.

The physical characteristics of the NBSA sampling locations will influence the equipment selection for collection of biological samples. Because the selection of appropriate sampling equipment is important for obtaining adequate tissue samples during future sampling activities, various sampling techniques will be used to identify the availability of target organisms (e.g., blue crabs and clams). For example, clams are a proposed target species and are typically collected using clamming forks, surface

grab samplers, drags, or digging by hand. During the Reconnaissance Survey, several of the less intrusive techniques (e.g., clamming forks, digging by hand) will be attempted to verify that they will be sufficient for capturing adequate numbers of clams, or whether more disruptive techniques (e.g., drags or grab samplers) will be required. Similarly, commercial-style crab pots will be deployed to verify that sufficient numbers of crabs can be collected using this technique. The detailed procedures for identifying sampling areas and evaluating equipment feasibility are provided in Appendix C SOP – Identification of Sampling Locations and Appendix D SOP – Evaluation of Sampling Approaches.

4.2 Reporting

The accessibility of the intertidal area (e.g., high tide only, both high and low tides, not accessible by boat) will be documented on the Identification of Sampling Locations Field Data Sheet (Attachment C-1 to Appendix C). If the intertidal area is deemed accessible and suitable for sampling benthic invertebrates and sediment, coordinates of potential sampling locations in the intertidal areas will be recorded using a GPS. The results of field trials using various sampling gear will be documented in the Evaluation of Sampling Approaches Field Data Sheet (Attachment D-1 to Appendix D).

5. Bird Nest Survey

The collection of bird eggs for contaminant analysis has been identified in the Problem Formulation (Tierra 2013a) as a data need for completing the BHHERA. As such, the purpose of this task is to identify possible bird nesting areas for the collection of eggs during the 2014 field season.

To conduct the nest survey, possible bird nesting areas will be identified based on existing information, and these locations will be visited in the field to characterize the abundance of nests. At the time of the Reconnaissance Survey most birds will have likely abandoned their nests. However, any nests that are left behind will provide insight into potential nesting areas to sample during spring 2014, when the bird egg collection will occur. Anticipated areas include all shorelines of the Bay, around Shooters and Pralls Islands, and in marshes in the southern Bay and northern portion of the Arthur Kill. The southern portions of the Bay and the islands are known to be home for many waterbird colonies, especially double-crested cormorants (*Phalacrocorax auritus*).

5.1 Methods

Prior to conducting the field work, potential nesting area information from prior years will be researched, and possible nesting locations will be identified on maps. These areas will include areas such as Shooters Island and marshes along the southern portions of the Bay and near the Arthur Kill.

The potential nesting areas will be visited by boat. Field ecologists will walk the areas searching for bird nests, and the number and condition of nests will be documented and photographed. The detailed procedures for conducting the bird nest survey are provided in Appendix E SOP – Bird Nest Survey.

5.2 Reporting

Any observed nests will be documented in the Bird Nest Survey Field Data Sheet (Attachment E-1 to Appendix E). GPS coordinates of the location, description of the area, number of nests, possible species, and any other descriptions about the nests or areas the nests are located in will be noted on the Field Data Sheet.

Information from the bird nest survey will be used to help identify sample locations for egg collection activities proposed for spring 2014.

6. Mammal Survey

Potential risks to mammals will be evaluated as part of the BHHERA. However, there is little information available regarding mammal usage of either the shorelines or waterways with the NBSA. While documentation of marine mammal usage of the Bay proper is not feasible in a survey of this type, the shorelines and near-shore areas can be visually inspected for direct observations and/or indirect signs of mammal usage (e.g., sightings, tracks, trails, scat), including species-specific information. Information such as species, time, location, and activities observed will be recorded.

6.1 Methods

During the shoreline habitat characterization survey (Task 1), field ecologists will disembark the small boat and walk along likely habitat areas along the shoreline looking for possible mammal species or signs of mammals using the NBSA. The detailed procedures for conducting the mammal survey are provided in Appendix F SOP – Mammal Survey.

6.2 Reporting

Any observations of mammals or signs of mammal presence will be recorded on the Mammal Survey Field Data Sheet (Attachment F-1 to Appendix F). This will include observation, possible species, date, time, area, and habitat. The specific location will be recorded using a hand-held GPS.

7. Reconnaissance Survey Reporting and Schedule

The field data sheets, associated field log notes, photographs, and video will be compiled and presented as attachments to a report that documents the Reconnaissance Survey. The Reconnaissance Survey Report will discuss the activities that occurred during the survey, and the major findings and observations. The report will include the results of the shoreline habitat characterization, shoreline human use characterization, identification of sampling locations, evaluation of sampling approaches, bird nest survey, and mammal survey. The Reconnaissance Survey is anticipated to take one week, and is scheduled to occur sometime in August/September 2013.

8. References

Tierra. 2005. Newark Bay Study Area Remedial Investigation Work Plan. Sediment Sampling and Source Identification Program. Newark Bay, New Jersey. Volume 3 of 3. Health and Safety/Contingency Plan. Tierra Solutions, Inc. East Brunswick, New Jersey. Revision 1. September.

Tierra. 2007. Newark Bay Study Area Phase II Remedial Investigation Work Plan. Volume 1a of 2. Revision 2. Addendum 1. Appendix F - SOP No. 1 Decontamination.

Tierra. 2013a. Final Newark Bay Study Area Problem Formulation. Baseline Human Health and Ecological Risk Assessment. Tierra Solutions, Inc. East Brunswick, New Jersey. June.

Tierra. 2013b. Draft Phase I and Phase II Data Evaluation and Analysis Report. Newark Bay Study Area. Remedial Investigation. Tierra Solutions, Inc. East Brunswick, New Jersey. Revision 1. March.

USEPA. 1997. *Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments.* Interim Final. USEPA/540/R-97/OCS. June.

USEPA. 2004. Administrative Order on Consent for Remedial Investigation and Feasibility Study, Newark Bay Study Area, USEPA Index No. CERCLA-02-2004-2010. United States Environmental Protection Agency. Including all attachments, amendments, and updates.

USEPA. 2010. Memorandum from James E. Woolford to Superfund National Program Managers, Regions 1-10 Re: *Considering Reasonably Anticipated Future Land Use and Reducing Barriers to Reuse at EPA-lead Superfund Remedial Sites.* OSWER Directive 9355.7-19. March 17.

Figures

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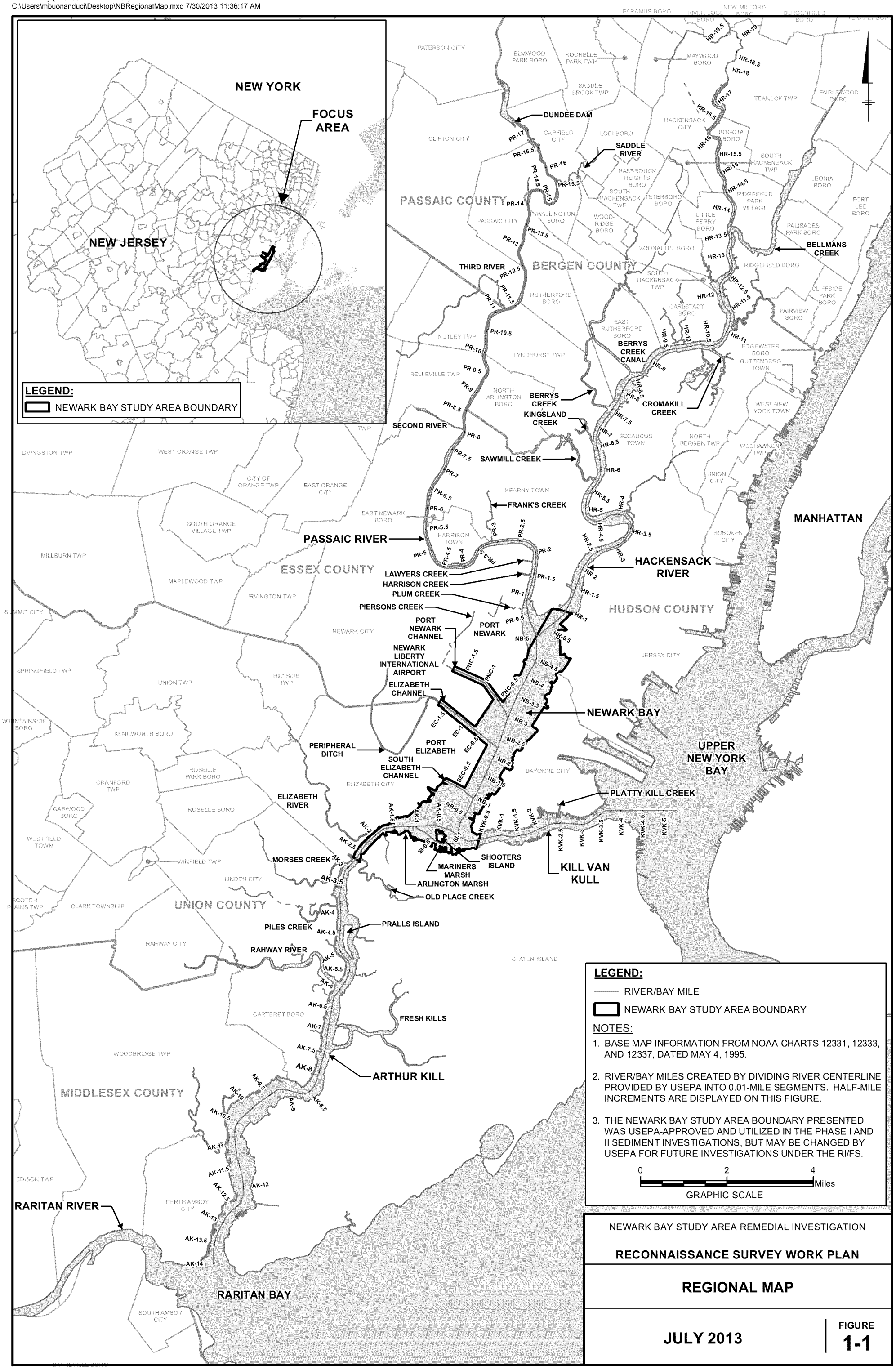

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LEGEND:

- INTERTIDAL AREA TARGETED FOR SAMPLING
- RIVER/BAY MILE
- NEWARK BAY STUDY AREA BOUNDARY
- SHORELINE
- UNDERGROUND TRIBUTARY

GEOGRAPHIC AREAS

- ARTHUR KILL
- KILL VAN KULL
- HACKENSACK RIVER
- NEWARK BAY NORTH
- NEWARK BAY CENTRAL
- NEWARK BAY SOUTH

GEOMORPHIC AREAS

- INTERTIDAL AREAS
- INDUSTRIAL WATERFRONT AREA

0 2,500 5,000 Feet

GRAPHIC SCALE

PR 5.0 PR 4.5 PR 4.0 PR 3.5 PR 2.0 PR 1.5 PR 1.0 PR 0.5

HR 2.0 HR 1.5 HR 1.0 HR 0.5 HR 0.0/PR 0.0

HACKENSACK RIVER

PASSAIC RIVER

CONRAIL BRIDGE REMNANTS

PIERSONS CREEK

PORT NEWARK CHANNEL

PNC 1.5 PNC 1.0 PNC 0.5

ELIZABETH CHANNEL

EC 1.5 EC 1.0 EC 0.5 EC 0.0

NEWARK LIBERTY INTERNATIONAL AIRPORT

NEWARK BAY CDF (CELL 1S)

PERIPHERAL DITCH

SOUTH ELIZABETH CHANNEL

SEC 0.5 SEC 0.0

NB 5.0 NB 4.5 NB 4.0 NB 3.5 NB 3.0 NB 2.5 NB 2.0 NB 1.5 NB 1.0 NB 0.5 NB 0.0

ELIZABETH RIVER

AK 2.5 AK 2.0 AK 1.5 AK 1.0 AK 0.5 AK 0.0/KVK 0.0 AK 3.0

SI 0.0 SI 0.5 SI 1.0

SHOOTERS ISLAND

GOETHALS BRIDGE

ARTHUR KILL

BAYONNE BRIDGE

KVK 0.5 KVK 1.0 KVK 1.5 KVK 2.0 KVK 2.5 KVK 3.0

KILL VAN KULL

NOTES:

1. HORIZONTAL DATUM: NEW JERSEY STATE PLANE COORDINATE SYSTEM, NAD83.
2. SHORELINE IS DIGITIZED FROM AERIAL PHOTO DATED JULY 2002 (INTRASEARCH, ENGLEWOOD, CO).
3. THE GEOMORPHIC AREAS SHOWN ARE CONSISTENT WITH THOSE PRESENTED IN THE PHASE I AND PHASE II DATA EVALUATION AND ANALYSIS REPORT (TIERRA 2013b).
4. RIVER/BAY MILES CREATED BY DIVIDING RIVER CENTERLINE PROVIDED BY USEPA INTO 0.01-MILE SEGMENTS. HALF-MILE INCREMENTS ARE DISPLAYED ON THIS FIGURE.
5. ABBREVIATIONS ARE AS FOLLOWS:
   AK = ARTHUR KILL
   EC = ELIZABETH CHANNEL
   HR = HACKENSACK RIVER
   KVK = KILL VAN KULL
   NB = NEWARK BAY
   PNC = PORT NEWARK CHANNEL
   PR = PASSAIC RIVER
   SEC = SOUTH ELIZABETH CHANNEL
   SI = SHOOTERS ISLAND

NEWARK BAY STUDY AREA REMEDIAL INVESTIGATION

RECONNAISSANCE SURVEY WORK PLAN

INTERTIDAL AREAS

JULY 2013

FIGURE 1-2

Appendix A

Standard Operating Procedure –
Shoreline Habitat Characterization

Appendix A

Standard Operating Procedure

Shoreline Habitat Characterization

July 2013

Revision 0

1. Purpose and Scope

The purpose of this document is to define the standard operating procedure (SOP) for conducting a shoreline habitat characterization survey as part of the Reconnaissance Survey for the Newark Bay Study Area (NBSA).

This SOP gives descriptions of field procedures necessary to quantify and characterize the extent and type of existing shoreline habitats, and to conduct a qualitative survey for birds and other biota.

This SOP may change depending upon field conditions, equipment limitations, or limitations imposed by the procedure. The ultimate procedure employed will be documented in the Reconnaissance Survey Report for the NBSA.

2. Procedures

2.1 Equipment List

The following equipment list contains materials that may be needed to perform the procedures outlined in this SOP. Note that not all equipment listed below may be necessary for a specific activity, and additional equipment not listed here may be required dependent on field conditions.

- sampling vessel adequate for Newark Bay conditions
- camera
- video camera
- ecological checklists
- neutral or camouflage clothing
- field guides (e.g., plants, mammals, birds)
- maps of the survey area
- tide tables
- binoculars
- waterproof pen or marker

- logbook
- global positioning system (GPS) unit.

2.2 Survey Procedures

An observational shoreline habitat characterization will be conducted as described in this SOP. The objectives of the characterization are the following:

- Document the ecological community that exists within the NBSA.
- Identify possible stressors (e.g., habitat limitations) that may be affecting the system.
- Document the locations of environmentally sensitive habitats/natural resources that may occur in the NBSA.
- Document potential contaminant migration/exposure pathways.

The survey will be conducted systematically by boat. If time allows, the survey will be conducted during two periods: at or near low tide and at or near high tide. This will confirm that the extent of shoreline habitats, including intertidal wetland areas, can be accurately mapped and to confirm their accessibility. Surveys will be conducted between the hours of dawn and dusk.

The survey will include visual observations conducted during a slow-speed boat reconnaissance of the entire NBSA. Both videographic and photographic records will be made of the entire shoreline. Additionally, the location and extent of habitats will be determined using a GPS unit.

2.3 Shoreline Habitat Characterization

The purpose of the shoreline habitat survey is to document and quantify the physical features and composition of the shoreline of the NBSA. The shoreline habitat survey will also focus on identifying and characterizing potential sources of contamination to the NBSA, including adjacent industrial properties, tributaries or ditches, and stormwater outfalls and/or combined sewer overflows (CSOs). Field crews will also ground-truth actual conditions on-site against pre-survey maps to determine if adjustments are required to subsequent survey and study designs.

It is anticipated that most of the shoreline habitat surveys will be conducted by boat. If possible, some shoreline points may be accessed on foot to better identify and

characterize specific areas that may be difficult to observe or access by boat. Field crews will not trespass on private property if accessing shoreline areas by foot. The following data and information will be collected:

- Land use along the NBSA shoreline (i.e., industrial, commercial, residential, or natural habitat)
- Shoreline characteristics, including, but not limited to, quantification of linear bulkhead, riprap, wetland vegetation, and aquatic habitat
- Observations of fish and wildlife
- Locations of plant communities that comprise the shoreline habitats (e.g., species, extent, abundance, condition)
- The presence of larger outfalls, discharge pipes, and CSOs, including their location, condition, and apparent state of discharge
- Miscellaneous observations regarding physical characteristics of the NBSA, including, but not limited to, tidal flow/currents, water quality, soil/sediment conditions, and any evidence of ongoing contamination.

Videographic and photographic records will be made of the entire shoreline, and the location and extent of various habitats will be determined using a GPS unit. These methods will help to confirm that accurate detail is provided in the Reconnaissance Survey Report, as well as with appended visual records.

3. Quality Assurance

The following quality assurance/quality control procedures will be performed during the shoreline characterization:

- Two ecologists will make/confirm observations regarding habitat types, extent, and the primary plant communities that comprise each habitat
- Times of photographs and related observations will be noted in the logbook.

Locations of physical features in the NBSA will be marked both on maps in the field, as well as registered in a GPS unit.

4. Documentation

The field personnel are responsible for documenting field activities related to the shoreline characterization survey. Observations and data will be recorded with ink in a logbook with consecutively numbered pages. Information to be recorded in the logbook, will include at a minimum:

- Responsible person's name
- Dates and times of activities
- Lists of all species observed
- Location and description of all habitats observed
- Information about each photograph (i.e., date, time, location).

5. Field Data Sheet

See Attachment A-1.

Newark Bay Study Area
Reconnaissance Survey
Attachment A-1

Field Data Sheet – Shoreline Habitat Characterization [pg 1/3]

Location:

Date: **Time:**

Crew:

Weather Conditions: **Tide:**

Habitat Type:

Habitat Description:

Plant Community/Dominant Plant Species:

Wildlife Observed:

Photolog:

Newark Bay Study Area
Reconnaissance Survey

Field Data Sheet – Shoreline Habitat Characterization [pg 2/3]

Adjacent Land Use:

Habitat Features:

Type:	GPS Coordinates:
Type:	GPS Coordinates:
Type:	GPS Coordinates:
Type:	GPS Coordinates:
Type:	GPS Coordinates:
Type:	GPS Coordinates:

Outfalls and Tributaries:

Type:	GPS Coordinates:
Type:	GPS Coordinates:
Type:	GPS Coordinates:
Type:	GPS Coordinates:
Type:	GPS Coordinates:

Sketch:

Newark Bay Study Area
Reconnaissance Survey

Field Data Sheet – Shoreline Habitat Characterization [pg 3/3]

Additional Notes:

Signature:

Appendix B

Standard Operating Procedure – Shoreline Human Use Characterization

Appendix B

Standard Operating Procedure

Shoreline Human Use Characterization

July 2013

Revision 0

1. Purpose and Scope

The purpose of this document is to define the standard operating procedure (SOP) for determining the extent of human use along the shoreline of the Newark Bay Study Area (NBSA) and to identify possible exposure pathways potentially affecting human health.

This SOP may change depending upon field conditions, equipment limitations, or limitations imposed by the procedure. The ultimate procedure employed will be documented in the Reconnaissance Survey Report for the NBSA.

2. Procedures

Field crews will survey areas of the NBSA shoreline to observe areas of human use, including, but not limited to the following, fishing/crabbing spots, swimming areas or beaches, recreational areas, and adjacent residential areas or other access points. Any observations will be documented on the field data sheet (Attachment B-1). The field crew will ground-truth the desktop survey conducted for the Problem Formulation. Areas to be surveyed will be identified prior to reconnaissance activities and plotted on maps to be used by the field crew. At no time during the survey will the field crew(s) knowingly trespass on private property. Instead, inaccessible areas will be documented with photographs.

The equipment list for shoreline human use characterization is as follows:

- ☐ sampling vessel adequate for Newark Bay conditions
- ☐ camera
- ☐ video camera
- ☐ maps of the survey area
- ☐ tide tables
- ☐ binoculars
- ☐ waterproof pen or marker
- ☐ logbook
- ☐ global positioning system (GPS) unit.

3. Field Data Sheet

See Attachment B-1.

Newark Bay Study Area
Reconnaissance Survey
Attachment B-1

Field Data Sheet – Shoreline Human Use Characterization [pg 1/1]

Location:

Date: **Time:**

Crew:

Weather Conditions: **Tide:**

Human Use Observations:

Zone: Industrial/Commercial/Residential/Recreational/Other:

Number of People Observed: Activity:

GPS Coordinates and/or Approximate Location:

Photolog:

Additional Notes:

Signature:

Appendix C

Standard Operating Procedure – Identification of Sampling Locations

Appendix C

Standard Operating Procedure

Identification of Sampling Locations

July 2013

Revision 0

1. Purpose and Scope

The purpose of this document is to define the standard operating procedure (SOP) for field identification of sampling locations as part of the Reconnaissance Survey for the Newark Bay Study Area (NBSA).

This SOP may change depending upon field conditions, equipment limitations, or limitations imposed by the procedure. The ultimate procedure employed will be documented in the Reconnaissance Survey Report for the NBSA.

2. Procedures

Field crews will navigate, in a vessel suitable to conditions present on-site, to intertidal areas using previously prepared maps (e.g., Figure 1-2). Field crews will assess the accessibility of the areas and record their determinations on the attached field data sheet (Attachment C-1). Field crews will evaluate suitability of substrate and accessibility based on various tidal stages. Coordinates of potential sampling locations determined to be acceptable will be recorded using a GPS unit.

The equipment list for the identification of sampling locations is as follows:

- ☐ sampling vessel adequate for Newark Bay conditions
- ☐ camera
- ☐ video camera
- ☐ maps of the survey area
- ☐ tide tables
- ☐ binoculars
- ☐ waterproof pen or marker
- ☐ logbook
- ☐ global positioning system (GPS) unit.

3. Field Data Sheet

See Attachment C-1.

Newark Bay Study Area
Reconnaissance Survey
Attachment C-1

Field Data Sheet – Identification of Sampling Locations [pg 1/1]

Location:

Date: **Time:**

Crew:

Weather Conditions: **Tide:**

Identify Sampling Locations:

Safety Hazards Present:

Accessibility of Intertidal Area:

Additional Notes (Benthic Organisms/Substrate):

GPS Coordinates:

Photolog

Signature

Appendix D

Standard Operating Procedure – Evaluation of Sampling Approaches

Appendix D

Standard Operating Procedure

Evaluation of Sampling Approaches

July 2013

Revision 0

1. Purpose and Scope

The purpose of this document is to define the standard operating procedure (SOP) for evauating sampling approaches to be used for the collection of biota samples in the Newark Bay Study Area (NBSA).

This SOP may change depending upon field conditions, equipment limitations, or limitations imposed by the procedure. The ultimate procedure employed will be documented in the Reconnaissance Survey Report for the NBSA.

2. Procedures

Field crews will attempt to carry out various field sampling techniques (e.g., clamming forks, dredges, hand digging, commercial crab pots) to determine the most appropriate and effective equipment for sampling benthic invertebrates in the intertidal areas. Field crews will also note the availability of targeted benthic organisms to determine if their abundance is sufficient to meet the data needs identified in the Problem Formulation. Field crews will record their determinations on the attached field data sheet (Attachment D-1). Field crews will also verify the presence or absence of biota targeted for tissue sampling.

The equipment list for the evaluation of sampling approaches is as follows:

- sampling vessel adequate for Newark Bay conditions
- camera
- ecological checklist of target invertebrate species
- sampling equipment (e.g., crab pots, clamming forks, ponar dredge, hand auger)
- sediment probe
- tide chart
- maps of the survey area
- waterproof pen or marker
- logbook
- global positioning system (GPS) unit.

3. Field Data Sheet

See Attachment D-1.

Newark Bay Study Area
Reconnaissance Survey
Attachment D-1

Field Data Sheet – Evaluation of Sampling Approaches [pg 1/1]

Location:

Date: **Time:**

Crew: **Tide:**

Weather Conditions:

Sampling Feasibility Survey:

Sampling Method	Target Species/# of Individuals Caught

Photolog:

Additional Notes:

Signature:

Appendix E

Standard Operating Procedure –
Bird Nest Survey

Appendix E

Standard Operating Procedure

Bird Nest Survey

July 2013

Revision 0

1. Purpose and Scope

The purpose of this document is to define the standard operating procedure (SOP) for a bird nest survey to be performed in support of determining potential locations for the collection of bird eggs during subsequent field sampling efforts in the Newark Bay Study Area (NBSA).

This SOP may change depending upon field conditions, equipment limitations, or limitations imposed by the procedure. The ultimate procedure employed will be documented in the Reconnaissance Survey Report for the NBSA.

2. Procedures

Field crews will survey the NBSA shoreline to observe known bird nesting areas for egg collection during the following spring. These areas will include the shorelines of Shooters and Pralls Islands, the northern portion of the Arthur Kill, and marshes in the southern portion of Newark Bay. Any observations of bird nests will be recorded on the field data sheet (Attachment E-1). Notes will include, but are not limited to, location (including GPS coordinates), nest description, possible species, and habitat type. Photographs of all bird nests will be taken for future reference. For identification of possible species, standard field guides such as *The Birders Handbook* (Ehrlich et al. 1988) and the *Peterson Field Guide: Eastern Birds' Nests* (Harrison 1998), as well as the list of birds common to the NBSA will be used to match nests with species.

The equipment list for the bird nest survey is as follows:

- camera
- neutral or camouflage clothing
- ecological checklist of birds common to the NBSA
- field guides for birds (e.g., *The Birders Handbook* [Ehrlich et al. 1988], *Peterson Field Guide: Eastern Birds' Nests* [Harrison 1998])
- maps of the survey area
- binoculars
- waterproof pen or marker
- logbook

- ☐ global positioning system (GPS) unit.

3. Field Data Sheet

See Attachment E-1.

Newark Bay Study Area
Reconnaissance Survey
Attachment E-1

Field Data Sheet – Bird Nest Survey [pg 1/1]

Location:

Date: **Time:**

Crew:

Weather Conditions:

Bird Nest Survey Observations

Species (Potential or Known): Nest Description:

Habitat:
GPS Coordinates: Number of Nests:

Species (Potential or Known): Nest Description:

Habitat:
GPS Coordinates: Number of Nests:

Species (Potential or Known): Nest Description:

Habitat:
GPS Coordinates: Number of Nests:

Species (Potential or Known): Nest Description:

Habitat:
GPS Coordinates: Number of Nests:

Photolog

Additional Notes

Signature

Appendix F

Standard Operating Procedure – Mammal Survey

Appendix F

Standard Operating Procedure

Mammal Survey

July 2013

Revision 0

1. Purpose and Scope

The purpose of this document is to define the standard operating procedure (SOP) for a mammal survey to be performed during the Newark Bay Study Area (NBSA) Reconnaissance Survey.

This SOP may change depending upon field conditions, equipment limitations, or limitations imposed by the procedure. The ultimate procedure employed will be documented in the Reconnaissance Survey Report for the NBSA.

2. Procedures

Field crews will document mammal usage in different habitat types within the NBSA. During the shoreline habitat characterization survey, field crew will disembark from the boat and walk along shoreline areas looking for potential mammal species or signs of mammal usage (e.g., scat, tracks). Any observations of mammal use will be documented via photographs and recorded on the field data sheet (Attachment F-1).

The equipment list for the mammal suvey is as follows:

- camera
- ecological checklist of mammals in NBSA
- neutral or camouflage clothing
- field guide (e.g., *Peterson Field Guide to Mammals of North America* [Reid 2006])
- maps of the survey area
- binoculars
- waterproof pen or marker
- logbook
- global positioning system (GPS) unit.

3. Field Data Sheet

See Attachment F-1.

Newark Bay Study Area
Reconnaissance Survey
Attachment F-1

Field Data Sheet – Mammal Survey [pg 1/1]

Location:

Date: **Time:**

Crew:

Weather Conditions:

Mammal Survey Observations

Observation Type: Species:

GPS Coordinates:

Habitat:

Observation Type: Species:

GPS Coordinates:

Habitat:

Observation Type: Species:

GPS Coordinates:

Habitat:

Photolog:

Additional Notes:

Signature: